CARNIVOROUS PLANT NEWSLETTER

VOLUME 26, NUMBER 4 December 1997

CARNIVOROUS PLANT NEWSLETTER

Official Journal of the International Carnivorous Plant Society

Volume 26, Number 4
December 1997

Front Cover: *Utricularia macrocheilos*. Photo by Martin Zevenbergen.
Rear Cover: *Pinguicula caerulea*. A painting by Scott Bennett.

Carnivorous Plant Newsletter is dedicated to spreading knowledge and news related to carnivorous plants. Reader contributions are essential for this mission to be successful. Do not hesitate to contact the editors with information about your plants, conservation projects, field trips, or noteworthy events. All material for publication must be sent to one of the editors. Contributors should review the "Instructions to Authors" printed in the March issue of each year.

Views expressed in this publication are those of the authors, not the editorial staff.

All correspondence regarding dues, address changes and missing issues should be sent to the ICPS c/o the Secretary/Treasurer. Do not send such correspondence to the editors. Checks for subscriptions and reprints should be made payable to the ICPS.

Date of effective publication of the September 1997 issue of Carnivorous Plant Newsletter: 26 September 1997

PUBLISHER: The International Carnivorous Plant Society by the Fullerton Arboretum, California State University, Fullerton, CA 92834-6850. Published quarterly with one volume annually. Desktop Publishing: Steve Baker, 5029 West Piedmont Circle, Conover, NC 28613. Printer: Kandid Litho, 1077 East Enda Place, Covina, CA 91724. Masthead Art: Paul Milauskas, 38 Manchester Court, Fox River Grove, IL 60021. Dues: $15.00 annually. $20.00 foreign. Reprints available by volume only ISSN #0190-9215. Circulation 866 yearly.

EDITORIAL

JAN SCHLAUER

Dear fellow carnivorous plant enthusiasts,

An international community like the ICPS requires international actions and events. The year 1997 witnessed the birth of a most remarkable and promising initiative—to change ICPS members from mere recipients of Carnivorous Plant Newsletter into active participants of a convention, the first Conference of the International Carnivorous Plant Society hosted by the Atlanta Botanical Garden, USA. The attendees to this conference were so enthusiastic about its success that they decided *ad hoc* to repeat this meeting as soon as possible. After some thought and negotiation, Europe was chosen to host the next ICPS conference. Thus, it is a particular pleasure for me to invite you, dear members, to participate in:

The Second Conference of the International Carnivorous Plant Society
May 30 - June 1, 1998
Botanic Garden Bonn, Germany

This forthcoming event will be organized in cooperation with the German carnivorous plant society (GFP), and the Botanic Garden of the University of Bonn. The program will include: the Fourth International Carnivorous Plant Exhibition in continuation of a tradition originally established in Gent, Belgium, with an awarding of the best plants in the show; twenty lectures by internationally renowned carnivorous plant experts; and poster presentations by those who want to share their experiences with other participants. But the most important goal of the conference will of course be the opportunity to meet many other people interested in the various aspects of carnivorous plants from around the globe. Instructions will be provided on how to visit the finest carnivorous plant habitats and collections in Germany and Europe.

All interested in participating in the conference should complete the registration form appended to this issue of Carnivorous Plant Newsletter and send it to:

Frank Gallep
Zweibrückenstr. 31
40625 Düsseldorf
Germany

I hope to see you in Bonn soon!

Another, less pleasant issue is that the March and June issues of Carnivorous Plant Newsletter arrived unacceptably late (if at all!) to some of our members. This happened because of a most unlikely and therefore the more regrettable series of organisational and technical failures—including a change of officers after the renewals had been received, and a computer hard-drive crash which led to a temporary inability to access our membership database! Our new Secretary/Treasurer, Ken Cusson has performed an enormous task during the past months in order to reconstruct the membership database, and we hope that the status quo is regained now. These lines are written at about the time when the September 1997 issue of Carnivorous Plant Newsletter is about to be sent to its readers, and we believe the missing issues were sent to our patient readers. All those responsible for a smooth production and distribution of Carnivorous Plant Newsletter apologize for any inconvenience that may have occurred during the first half of 1997, and we hope that it has been made good in the meanwhile. Appropriate measures have been taken to prevent a similar irregularity in the future. Thank you very much for your patience.

In Search of *Utricularia pobeguinii*: a Field Trip in Guinea, Western Africa

Martin J. Zevenbergen
Commandeursweg 130
6721 ZP Bennekom
The Netherlands
Martin.Zevenbergen@algem.pt.wau.nl

Keywords: travelogue: *Drosera,* Guinea, *Utricularia.*

In December 1992, I traveled to Guinea (capital: Conakry), in West Africa. Before my trip I prepared myself a little bit because I was curious which carnivorous species I could expect. Only a few *Drosera* species grow in this country, so this was not very spectacular. Nevertheless, according to Taylor's monograph, sixteen *Utricularia* species grow in Guinea, a substantial part of them being restricted to West Africa. My attention was especially attracted by the species *U. pobeguinii*, which is found only in a very small region within Guinea. Further carnivores are some species of the genus *Genlisea*, which I unfortunately did not find.

During my stay, I visited only two sites with carnivorous plants; nevertheless ten of the sixteen *Utricularia* species occurring in Guinea were found. The first spot was at the side of the main road from the capital to Kindia, between Tabili and Mambia, in the mountains at an altitude of approximately 500 m above sea level. I saw this spot from the car on an earlier trip to Kindia. During that trip, it drew my attention because of the yellow flowers and the water that was seeping over rocks. Later (30 December) I returned, and succeeded in convincing the bush-taxi driver that I really wanted to get out at this particular spot (at first he did not want to stop because there was no village). The yellow flowers I saw from the car turned out to be a *Utricularia*, and after some nosing about, I found eight carnivorous plant species.

U. macrocheilos: This was the plant that I saw already from the taxi. It is a plant with tall scapes 10—30 cm high, with large bright yellow flowers (see front cover). This was the most abundant species on the site. It was growing in a wet sandy soil layer on top of a rock

Figure 1: *U. spiralis*. Note the spiraling peduncles. *D. indica* can be seen in the corner and in the background.

Figure 2: *U. firmula* (yellow flowers) and *D. indica* (pink flowers).

subsoil.

U. scandens: At first I thought this was the same as the former species, but the scapes are much smaller, 4—10 cm, and the spur in this species is tubular and narrow, while it is wide and conical in *U. macrocheilos*. The flowers are bright yellow. Here it was growing between *U. macrocheilos* and tall grass.

U. spiralis: This was also one of the more striking species, with large violet flowers, with a notable bright blue spot on the swollen part of the lower lip (Figure 1). The scapes were always twining, up to 30 cm tall. This species has a preference for the wettest spots, growing amphibiously in a muddy substrate, in which I was sinking up to my ankles.

U. firmula: Also a very abundant species with tiny scapes 3—10 cm tall, the flowers are yellow with a red spur (Figures 2, 3). It seems to have a preference for the spots with a lot of iron, at least the surface was rust-coloured. It was growing together, or at least in the vicinity of *U. pobeguinii*.

U. pobeguinii: This was the species I searched for especially, and I was very happy to find it (Figure 3). Some time ago, Peter Taylor lumped this species together with *U. spiralis*, but later separated them again in his monograph. I think this was a wise decision,

Figure 3: *U. pobeguinii* (blue flowers), *U. firmula* (yellow flowers), and *D. indica* (pink flowers).

because for me it was obvious that this is a distinct species. According to Taylor's monograph, the characteristic feature of *U. pobeguinii* is the obtuse spur, but other differences are: *U. pobeguinii* prefers a dryer habitat, is not twining, it has less tall scapes of 3—7 cm, and the flowers are blue with a white patch at the base of the lower lip.

U. pubescens: Although this species is widespread in the region, I found only a few plants with very tiny scapes (4 cm). This species was easily distinguished by its peltate leaves. The flower was a very pale purple.

U. subulata: Many of my comments regarding *U. pubescens* apply to this species, only a few plants were found of this so-called carnivorous plant weed. The scapes were up to 10 cm and bore up to ten pale yellow flowers.

Drosera indica: This species preferred the same spots as *U. pobeguinii* and *U. firmula*, it had pink flowers and was quite abundant (Figures 2, 3).

The second spot, which I visited on 3 January, is near the city of Kindia. It is northwest of the city, near Mount Gangan, and at the same altitude as the city (approximately 300 m). It is only a fifteen minute walk to the north from the hotel "Phare de Guinee" at the western part of town. From the above described species I found *U. macrocheilos*, *U. spiralis*, *U. subulata*, *U. firmula* and *D. indica*. In addition to these, I found also three other species.

U. micropetala: This is closely related to *U. macrocheilos*, but it appears to me that this species deserves a specific rank. The swollen spur of this species is relatively huge, the spur makes out 80% of the length of the flower. I found only small specimens, the scapes being up to 7 cm.

U. tetraloba: This species is a rheophyte growing in very shallow streaming but calm water. This was the most tiny species I found, the scapes being only 1—2 cm. Relatively the traps were quite big: 1 mm. The habitat was typically on a bare horizontal rock surface, at the margin of a layer of soil and vegetation on these rocks.

U. rigida: Also a rheophyte, this is closely related to *U. tetraloba*, but prefers another habitat: almost vertical rock surface with swiftly running water. At the time I visited the site it was not flowering anymore, but a lot of scapes with capsules were found. This, and the very typical habitat, was enough to identify this plant.

I took some plant material back home, but I did not succeed in growing any of the species. Although I succeeded in germinating the seed of *U. tetraloba* and *U. rigida*, I did not succeed in keeping them alive. I tried a setup with a little water pump and some rocks, but when algae became a problem I tried a mild algicide. First the seedlings reacted very well, and even were growing faster, but later on they died back. In the future I may well be traveling again to this country, so I might try again to bring some of these species into culture.

References:

Hutchinson, J. and Dalziel, J. M. 1954, Flora of West Tropical Africa: Vol. 1, Part 1, London (second edition, revised by Keay, R. W. J.).

Pellegrin, F. 1914, Contribution à l'étude de la flore de l'Afrique occidentale française: Lentibulariées, Bull. Soc. bot. Fr., 61: 13-21.

Taylor, P. 1989, The Genus *Utricularia*, Kew Bull. Additional ser. 14, HMSO, London.

Taylor, P. 1991, The genus *Genlisea*, Carniv. Pl. Newslett., 20: 20-26.

From the Pages of Carnivorous Plant Newsletter 25 Years Ago

Many of us have seen abnormal plants displaying "false vivipary," where mutated flowers produce plantlets instead of normal parts. This is not too uncommon in *Drosera* or *Dionaea*. But T. L. Mellichamp reported a real rarity: "I have observed this same phenomenon in the inflorescence of *Sarracenia purpurea* in northern Michigan along the sandy, marly beaches just west of Mackinaw City at the Straits. The inflorescence (?) was no taller than the rather compact, neat pitchers and it consisted of a rather disfigured rosette of pitcher leaves, instead of floral parts sitting upon the peduncle....there were many normal plants around."

GROWING *DROSERA CHRYSOLEPIS*

ARTHUR TER-HOVANESSIAN
1744 East Sycamore Avenue #6
El Segundo, CA 90245

IVAN SNYDER
110 Meyer Court
Hermosa Beach, CA 90254

Keywords: cultivation: *Drosera chrysolepis*.

The South American sundew *Drosera chrysolepis* is an attractive and unique plant. It forms a long upright stem with spear-shaped leaves, and can grow quite large. Comparing this species to one which is more commonly grown, Fernando Rivadavia describes it as, "looks like a giant *D. scorpioides*." This sundew has proven to be rather difficult to grow, and so is recommended for the experienced cultivator or sundew connoisseur. For this reason *D. chrysolepis* may continue to be extremely rare in cultivation.

The particular specimen illustrated (Figure 1) was grown from seed which was originally collected from nature in Serra do Cipo, Brazil, by our fellow carnivorous plant fanatic, the famous Fernando Rivadavia. A plant of the size in the photograph, about 13 cm (5 inches) will take well over a year to grow, thus making the plant all the more precious to its growers.

Seed is the most reliable way to propagate *D. chrysolepis* in quantity, since it does not sprout from leaf or root cuttings. Seed may be scattered atop a peat and sand mixture suitable for cultivating sundews. Germination will take place after several weeks, so it is best to supply very little light until sprouting occurs to prevent an overgrowth of algae and mosses. Newly germinated seedlings are fairly large compared to seedlings of most other sundews. Growth beyond the seedling stage will be very slow, so keep in mind that producing a fine-looking mature plant will require a considerable amount of patience. The newborn seedlings will feed upon minute springtails which are naturally occurring in the pots. This gives the capturing plantlets an extra boost. When the seedlings reach a centimeter or more in diameter they are then transplanted into a potting mixture of chopped live *Sphagnum* and perlite, in which they seem to grow best. The reason seed is not sown directly on live *Sphagnum* is that the *Sphagnum* will grow more quickly and smother the seedlings. Since growth is slow for this species, recovery from transplanting requires a period of convalescence. Following transplanting or any root disturbance, a clear plastic cup or other suitable tenting is placed over the plant to insure high humidity and prevent drying out. When active growth recommences, the tenting may be removed. Cultured fruit flies (*Drosophila melanogaster*) are an excellent food source for larger plants, and of course there is an added bonus in the thrill of watching the plants consume these little pests.

Figure 1: A 13 cm tall *Drosera chrysolepis* in cultivation (photograph by A. T. H.)

D. chrysolepis does not have a definite dormancy period, though growth seems to come and go in irregular cycles when grown under artificial lights with an unchanging long day photoperiod. You will find that the

plant is a very shy flowerer when grown under artificial conditions. So if you are thinking of trying to get your plant to produce seed, you must experiment. We wish you luck, since we have yet to see it flower.

There is still another method of reproduction, albeit slow, which you can use to reproduce your plant. As your *D. chrysolepis* grows to an extreme height, you may wish to reduce it again, as there is a maximum optimal height. This may be done by simply cutting the stem and replanting the top. New roots are produced near to the meristem or growth point, so cut the stem about five cm below, strip off most of the lower leaves and plant vertically so that the growth tip is just above ground. Now tent it as described earlier. Plant the lower portion of the stem, retaining a few leaves, as this may sprout a new growth point and form another plant. *D. chrysolepis* replanted in this manner makes the plant's growth immortal.

ICPS Seedbank

Tom Johnson, Coordinator
PO BOX 12281
La Crescenta, CA 91224-0981
Updated November 4, 1997

All Correspondence Must Be Accompanied
by a Self Addressed Stamped Envelope

Byblis gigantea
Darlingtonia californica
D. californica Florence OR
D. californica North-central California
Mix #1, Mix #2, Mix #3 (*see article in this issue*)
Dionaea muscipula
Ibicella lutea (5 seeds per packet)
Nepenthes alata Luzon Red Spotted
N. gracilis
Pinguicula grandiflora
P. lusitanica
Utricularia bisquamata
U. inflata
U. subulata large flower
Sarracenia flava
S. flava green with yellow/gold tops
S. flava Ben Hill Cty, Georgia
S. flava New Bern, NC
S. leucophylla
S. leucophylla grn w/ white & red tops
S. minor Fitzgerald, Georgia
S. oreophila green—inquire
S. purpurea purpurea NC Mountains
S. purpurea purpurea heterophylla
S. purpurea venosa
S. rubra rubra
S. alata × *leucophylla*
S. alata × *purpurea purpurea* pubescens
S. flava × *leucophylla*
S. flava × *leucophylla* "Milton"
S. flava "Okee Giant" × *purpurea venosa*
S. flava × *rubra* grn with goldtops
S. (leucophylla × *oreophila)* × *purpurea purpurea*
S. leucophylla × *oreophila* × self
S. oreophila × *flava*
S. oreophila × (*flava* × *leucophylla*)
S. (*oreophila* × *purpurea purpurea*) × self
S. (*oreophila* × *rubra*) × self
S. purpurea × *alata* Ltd
Drosera aliciae
D. binata complex Dichotoma small
D. binata North Plains, NZ
D. brevifolia white flower Hampstead, NC
D. brevifolia
D. burmannii
D. burmannii 'Beerwah, Qld'
D. capensis
D. capensis "green"
D. capensis "red narrow leaf"
D. capensis "wide leaf"
D. capensis "wide leaf" large form
D. capensis "narrow leaf"
D. capensis "white flower" or alba
D. capensis "purple flower"
D. capillaris
D. filiformis filiformis
D. filiformis tracyi Fitzgerald, GA
D. marchantii marchantii
D. rotundifolia Mendocino City, CA
D. rotundifolia Washington state
D. spatulata
D. spatulata Hairy Sepals, Gympy Qld
D. spatulata pink flower
D. spatulata Kanto
D. spatulata v. Kansai from Japan
D. spatulata Mt. Bartlefreare, Qld
D. species Magaliesburg
D. dielsiana × Sp. Transvaal

All seed contributions are gratefully accepted. Please forward to the above PO Box. Please protect the seeds from postal abuse. I use bubble wrap, although it does require an additional eleven cents in postage (within US). Note: Ltd. means the seeds are in very limited supply.

Please mail comments to: tjjohns@primenet.com

Reflections and Suggestions from 1996

Donald L. Graham
21206 S.E. 268th Place
Kent, WA 98042

Keywords: cultivation: bog-garden, Washington (USA).

August 1996 was an important benchmark in my ongoing experiment. Three years have passed since my creation of an outdoor carnivorous plant bog and pond. It has withstood the worst weather that this state has to throw at us. All of the plants are doing well, especially the *Darlingtonia* (no surprise here). The bog is peppered with a variety of *Pinguicula, Drosera, Sarracenia*, as well as venus flytraps. A recent discovery this September was a 15 cm high *Drosophyllum* hidden in the swamp grass: what a paradox! I have tried to grow them by the book and they died. I threw the old seed in the wet, rained-on bog and they grew! I guess the

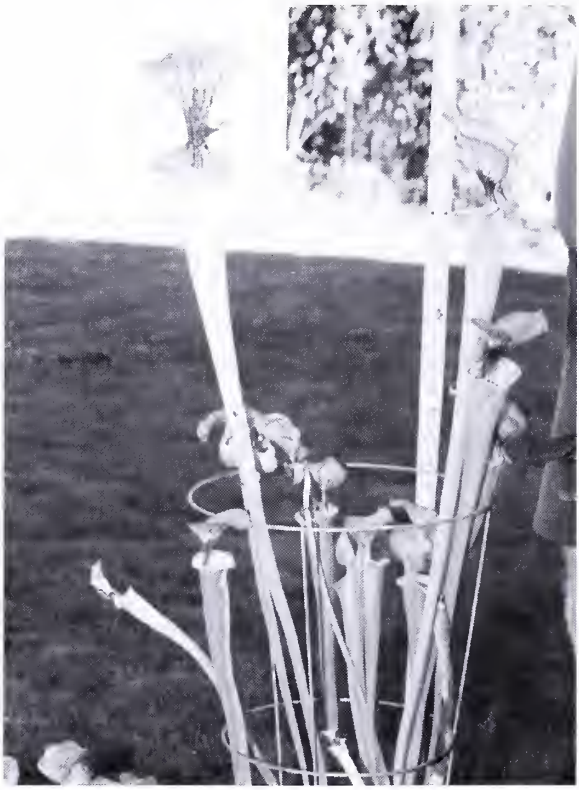

Figure 1: My 112 cm (44 inch) tall *Sarracenia flava*.

plant does not know what is best for it! The pond is loaded with *Utricularia inflata* and *U. macrorhiza*. These thriving colonies were collected from some local lakes. A good reference book on these localities can be found in Hawkeye Rondeau's publication "Carnivorous Plants of the West," to which I contributed.

The layout of my growing area may look simple; however a lot of thought, planning and effort went into this project. An open framework above the bog supports bird netting and timer-controlled misters. The water table is self-regulating. Strategically placed support bearings allow me to quickly install scaffolding. This temporary floor allows me to do my maintenance such as grooming, weeding, bug spraying and collecting seed for the ICPS seed bank. Multiple

Figure 2: *N. lowii* on a solar powered turntable.

security systems surround my bog and greenhouses. (See the article written by my friend David Wong, Carniv. Pl. Newslett. 25: 10). The greenhouse that contains the majority of *Nepenthes* is on the east side of my home.

Winter in Seattle, Washington means a lot of dark skies. To augment the shorter photoperiod, I have installed full spectrum fluorescent lighting. The big difference is the tubes are free hanging and vertical, which in my opinion is more efficient and cost effective. This method distributes the light equally to the upper and lower plants, which encourages lateral growth. With the return of spring I remove the lights. It is easy to use standard 20 or 40 watt fixtures and attach extension wire to each receptacle. Add new receptacles to the wire ends and you are ready. Do not install lamps whose wattage requirements exceed the rated value of the ballast being used.

Hobbyists who wish to grow as many of their carnivorous plants as possible outdoors and unprotected will have problems with wind and rain laying low the taller plants. My solution is to support them using inexpensive, readily available tomato cages. You can cut the cages to different heights to meet your requirements. The system provides 360^0 support. (Figure 1). Warning! File or grind off the cut ends as they are often razor sharp and could inflict nasty wounds.

Horticulturists tell us uniform lighting promotes uniform growth, which means turning our potted plants periodically. A good solution was found when I discovered a solar powered turntable by "Sunmate" at a local nature shop, list price $16. I bought the last one in that shop for $5. I would have bought ten of them at that price if available. The table is capable of supporting 30 pounds. The rotation speed varies with lighting conditions, one revolution takes two to three minutes. My highly prized *N. lowii* I acquired from Andreas Wistuba in 1994 gets exclusive use of this device (Figure 2). One of the most eye catching plants displayed at our Pacific Northwest meeting held in June was my gorgeous 80 cm tall red tubed *S. flava*. Occasionally, one receives a rare unexpected surprise in growing carnivorous plants. The surprise this year came from a *S. rubra*. It has a functional two headed pitcher on a single stalk (Figure 3, p120). Shortly after photographing this specimen, I removed the oddity and dried it in a high vacuum. It is now on display in my hobby room under a bell jar.

Figure 3: A double-pitchered *S. rubra* oddity.

LITERATURE REVIEWS

Ratsirarson, J., and J.A. Silander, Jr. 1996, Structure and dynamics in *Nepenthes madagascariensis* pitcher plant micro-communities. Biotropica 28:2, pp. 218-227.

N. madagascariensis produces two types of pitchers—small, goblet-shaped lower pitchers and large, trumpet-shaped upper pitchers. The waters in these pitchers function as temporary habitats for a variety of mosquito larvae, mites, and fly larvae, and several arthropod and lizard species that prey upon them. The authors studied the two pitcher types and their arthropod denizens. Not surprisingly, the arthropods found in the upper pitchers are not quite the same as those found in the lower pitchers. Although this paper does not reveal any astounding new discoveries, it offers a view into the natural history and food web relationships that exist within *Nepenthes* pitchers.

Much of the paper's analysis focuses on two species of mosquito larvae. The first is exclusively a filter feeder while the second augments its diet with prey (including members of the first species). The filter feeder prefers the upper pitchers while the predator species lives exclusively in the lower pitchers. Several other creatures are described, including a crab spider which descends on a thread into traps to forage underwater for prey, ants that drain pitchers by drilling holes into them so they may safely steal their contents, and mites that ride on flies to be transported to new pitchers. Various correlations between populations and pitcher characteristics are explored, but the results of the hard science are not particularly conclusive. (BAMR)

Ruiz, S.Z., & A.T. Salinas. 1996, Una nueva especie de *Pinguicula* (Lentibulariaceae) del estado de Oaxaca, Mexico. Acta Botanica Mexicana 37, pp. 39-44.

The authors describe *Pinguicula mirandae* from the Tehuacan-Cuicatlan region in the state of Oaxaca, Mexico as a new species. It belongs to the section Heterophyllum in subgenus Isoloba and is most closely related to *P. acuminata* but the leaves of the "summer" rosette are not acute but completely rounded at the apex, thus very superficially resembling those of *P. macrophylla* or *P. colimensis*. The flowers, with a long sharply bent corolla tube and a short spur, do however readily identify it as a member of Isoloba (to which e.g. *P. agnata* and *P. acuminata* belong) and not Orcheosanthus (to which *P. macrophylla* and *P. colimensis* belong).

The new and rather spectacular (if one appreciates the details) species is distinguished from *P. rotundiflora* by the glandular pubescent (not glabrous) pedicels, the geniculate (not straight) corolla tube and the clavate (without berry-like heads) hairs on the palate. Surprisingly (and rather inexcusably), the latter comparison is missing in the article although the two species are almost indistinguishable if not in flower. (JS)

Chen, L., James, S.H., & H.M. Stace. 1997, Self-incompatibility, Seed Abortion and Clonality in the Breeding Systems of Several Western Australian *Drosera* Species (Droseraceae), Australian Journal of Botany 45, pp.191-201.

The authors have cultivated twenty species of Western Australian *Drosera* under greenhouse conditions, pollinated the flowers artificially (with pollen of the same individual or of a different individual), and checked self-compatibility by assessing seed set and pollen tube growth. All fifteen investigated taxa of subgenus *Ergaleium* ("tuberous" sundews) were self-incompatible. In subgenus *Bryastrum* (erroneously called "*Rorella*" in the paper, "pygmy" sundews with gemmae), *D. nitidula* and *D. pulchella* were self-compatible, while *D. eneabba* and *D. mannii* (misspelled "*manniana*" in the paper) were self-incompatible. *Drosera glanduligera* (which the authors transferred to section *Lasiocephala*— Type: *D. petiolaris*— without explanation) was self-compatible. Self-incompatibility was due to inhibition of self-pollen tubes at various sites in the pistil. Seed abortion was studied in the self-compatible taxa (and found to be negligible) *D. mannii* and five taxa of subgenus *Ergaleium*. The proportions of good seeds vs. aborted seeds in the self-incompatible taxa ranged between 95:5 and 36:64. The highest abortion rates were found in *D. tubaestylis*.

Several new chromosome counts are published on pp. 192-193 (under the authorship of James, Chen, Lowrie & Marchant). The counts of n=16 for *D. gigantea* and n=15 for *D. menziesii* deviate from those published earlier (14 and 13, respectively) by Kondo. This may indicate that these (assumedly rather young and not genetically "consolidated") species form aneuploid series.

Apart from some taxonomic oversights (v.s.), the paper is well researched, and it offers many new and interesting data, rendering this an obligatory reading for all students with a serious interest in this genus. (JS)

Conran, J.G., Jaudzems, V.G., & N.D. Hallam. 1997, Droseraceae Germination Patterns and their Taxonomic Significance, Botanical Journal of the Linnean Society 123, pp. 211-223.

In this paper, the germination types (cryptocotylar—with the cotyledons not emerging from the seed coat, hemicryptocotylar—as the intermediate condition, or phanerocotylar—with the cotyledons leaving the seed coat entirely) and some morphological and phenological features of 113 accessions (corresponding to approximately one hundred taxa) of Droseraceae are featured. The results may be summarized as follows (the classification proposed by Schlauer in Carniv. Pl. Newslett. 25:67-88, 1996 is used here for comparison).

Phanerocotylar or hemicryptocotylar germination is found in *Drosophyllum, Dionaea*, *Drosera* subgenera *Phycopsis* (as a section of subgenus *Drosera* in the paper), *Drosera* (sections *Ptycnostigma*—as a separate subgenus in the paper—*Arachnopus*—including section *Prolifera* in the paper—and *Drosera sensu lato*), *Thelocalyx* (as a section of subgenus *Drosera* in the paper), *Stelogyne* (as a section of the illegitimate subgenus "*Rorella*" in the paper), and *Arcturia* (as section *Psychophila* of the illegitimate subgenus "*Rorella*" in the paper). *Drosera neocaledonica* (with phanerocotylar germination) is retained in what is called *Drosera* subgenus *Drosera* section *Lasiocephala* in the paper, although all other species in this section have a cryptocotylar germination pattern. Cryptocotylar germination characterizes *Aldrovanda*, *Drosera* subgenera *Lasiocephala* (as a section of subgenus *Drosera* in the paper), *Ergaleium*, *Bryastrum* (called "*Rorella*" in the paper, with the exceptions noted above), and *Coelophylla* (as a section of the illegitimate subgenus "*Rorella*" in the paper).

Glandular cotyledons are found in *Drosera* subgenera *Drosera* (section *sensu lato* including *D. neocaledonica* but excluding "section" *Lasiocephala sensu stricto*, section *Ptycnostigma*, together with taxa with eglandular cotyledons), and *Thelocalyx*.

Non-carnivorous primary leaves are found in *Aldrovanda* and some taxa of *Drosera* subgenus *Ergaleium* section *Ergaleium*.

The discussion of the paper is proposing reconsiderations within a conservative systematic alignment that is questionable in some respects. Therefore (and because the recent reclassification cited above has been ignored entirely in the present paper), a new discussion of the results is presented here.

At generic level (*Aldrovanda* - cryptocotylar, *Dionaea* - phanerocotylar, *Drosera* - various conditions, *Drosophyllum* is not a member of Droseraceae, as proved by genetical, morphological and palynological data, cf. Schlauer in Carniv. Pl. Newslett. 26:34-38, 1997) the germination pattern is too inconsistent for phylogenetic considerations. The fact that it is constant within all sections of *Drosera* (if these are defined as in Schlauer 1996, not as in the present paper) shows that it has a high value as a taxonomic marker at infrageneric level. It clearly excludes *Lasiocephala* (without *D. neocaledonica*!) from subgenus *Drosera* and brings the subgenera *Phycopsis*, *Thelocalyx*, *Stelogyne*, *Arcturia*, and *Regiae* (most of which considered fairly "primitive") into some proximity with subgenus *Drosera*. The imperative transfers of *D. neocaledonica* and *Ptycnostigma* to subgenus *Drosera* have already been proposed earlier. Cryptocotylar germination is confined to the predominantly (and probably originally) Australian subgenera *Ergaleium* ("tuberous" sundews), *Bryastrum* ("pygmy" sundews), *Lasiocephala* (*D. petiolaris* group), and *Coelophylla* (*D. glanduligera*). So this feature may represent an advanced condition developed (perhaps several times independently) in these Australian taxa.

As a consequence, subgenera *Coelophylla* (with a more "primitive" pollen type, indicating a position between the apparently ancestral subgenus *Thelocalyx* and the possibly more derived subgenus *Lasiocephala*) and *Lasiocephala* should be removed from their position at the "base" of subgenus *Drosera* (in contrast to their respective positions assigned in Schlauer 1996:69) and rather shifted towards the proximity of subgenus *Bryastrum*. This is also supported by formerly overlooked/underestimated similarities in leaf morphology: The laminae (not the stipules as stated on p. 218 of the present paper) of the recently described *D. caduca* (*Lasiocephala*) that may be missing (shed?) are homologous to the likewise detached gemmae produced by all members of subgenus *Bryastrum*.

Although it shares phanerocotylar germination with other ("primitive") groups, subgenus *Phycopsis* (*D. binata*) should retain its position between subgenera *Drosera* (phanerocotylar) and *Ergaleium* (cryptocotylar).

While the data are new and very important, the numerous nomenclatural inadequacies (many invalid names are used) and taxonomic mistakes (some of which have been known for a long time and were already corrected in the literature) are detrimental to a work of such ambition. Thus, many avoidable shortcomings are perpetuated once again. Nevertheless, this paper is an indispensable source of information for future research in the systematics of Droseraceae. (JS)

Komiya, S., Shibata, C., Toyama, M., & K. Katsumata. 1997, Carnivorous Plants in Hokkaido, northern Japan, Bulletin of the Nippon Dental University, General Education, 26, pp. 153-188 (in Japanese, description of *Utricularia* × *bentensis* on pp. 164-166 by S. Komiya in Latin)

This is a comprehensive review of the carnivorous plant species found on the northernmost Japanese main island. It deals with the species *Drosera anglica*, *Pinguicula macroceras*, *Utricularia australis*, *U. caerulea*, *U. intermedia*, *U. macrorhiza*, *U. minor*, *U. ochroleuca*, and *U. uliginosa*. The hybrid *D.* × *obovata* is discussed, but without obvious reason there is no reference to *D. rotundifolia* (one parent species of this hybrid) Previously, Diels (Pflanzenreich 26:95, 1906) cites a specimen from Sapporo (collected by Faurie). The most interesting taxon of this review is what is assumed to be a hybrid between *Utricularia minor* and *U. intermedia* and described as a new hybrid, *U.* × *bentensis*. It has features which superficially really look like intermediate between the two supposed parents but a closer examination of the internal quadrifid trap glands shows almost no influence of *U. intermedia* (in which the two arms of each pair are almost strictly parallel to each other). Instead, the shorter pair is bent in the direction of the longer pair, a condition very similar to that found in *U. minor* and exactly the same as found in *U. bremii*, which was so far only known from Europe. The flowers and leaves of *U.* × *bentensis* are so similar to those of *U. bremii* that there remains almost no doubt that it is really the same taxon. Possibly *U. bremii* is in fact of hybridogenic origin as no ripe seeds are known of this species (the pollen is apparently always malformed and sterile). Whether hybrid or not, the older name *U. bremii* should be applied to the plants from Hokkaido. This is a substantial range extension for this species. No mention is made of *U. stygia* (which is known from Europe and North America), so it can unfortunately not be judged if this species is really absent from Hokkaido or if it was only ignored as was done by Taylor (The Genus *Utricularia*: 612-613, 1989). (JS)

Schnell, D.E. & R.O. Determann. 1997, *Sarracenia purpurea* L. ssp. *venosa* (Raf.) Wherry var. *montana* Schnell & Determann (Sarraceniaceae): A new Variety, Castanea 62:1, pp. 60-62

This new variety from sphagnous seep bogs of the southern Appalachians has the distal hood lobes of the pitchers incurved adaxially so that they almost touch, and the hairs lining the hood are shorter than in the two other varieties of *Sarracenia purpurea* subsp. *venosa*. As we know from the previous publications of the first author, careful long-term observations both in the field and in cultivation have led to the discovery of a new taxon in a species that some would consider well investigated and completely

known. (JS)

Shibata, C. 1997, Ecological and Taxonomical Studies on Carnivorous Plants in Venezuela, 1994-1996, Bulletin of the Nippon Dental University, General Education, 26, pp. 199-217 (text in Japanese, description of new taxa in Latin by S. Komiya and C. Shibata, List of specimens collected in English)

On pages 209 and 210, *Utricularia chiakiana* and *U. humboldtii* f. *albiflora* are described as new. *U. chiakiana* is very similar to *U. gibba*, and the single difference seems to be the upper lip of the corolla which is smaller than the lower (larger than lower in *U. gibba*). However, the dubious statement "Valde affinis *Utricularia gibba* L." (very close to *U. gibba*) without subsequent diagnosis, leaves space for speculation if the authors really accept their new taxon (cf. Art. 34.1. ICBN). (JS)

Silva, T.R. dos S. 1997, *Drosera graomogolensis* (Droseraceae), a New Species from the Campos Rupestres of Minas Gerais, Brazil, Novon 7, pp. 85-87.

A new species of *Drosera* is described. It was featured by Fernando Rivadavia under the invalid name of "D. villosa var. graomogolensis" in Carniv. Pl. Newslett. 25: 134-137 (1996). According to the author it is related to *D. villosa*. However, the obovoid (not fusiform as in *D. villosa*!) seeds and the stem densely covered with dead leaf remains readily separate this new species from any other known from eastern Brazil. This is an interesting parallel to the stem-forming *D. roraimae* and *D. hirticalyx* from the Guayana Highland. The latter species do have distinct petioles while the species described here has a leaf shape somewhat similar to *D. villosa* without a clear distinction between petiole and lamina. (JS)

Bayer, R.J., Hufford, L. & D.E. Soltis. 1996, Phylogenetic relationships in Sarraceniaceae based on rbcL and ITS sequences, Systematic Botany 21:2, pp 121-134.

Another molecular approach to understanding carnivorous plant evolution is presented here. The findings confirm the molecular phylogeny published earlier (Albert *et al.*, Science 257:1491-1495, 1992), i.e., *Darlingtonia* is proposed as a sister to a clade containing *Sarracenia* and *Heliamphora*. This contrasts with the common perception that *Sarracenia* and *Darlingtonia* are more closely related to each other than either is to *Heliamphora*. The South American origin (or in other words, a *Heliamphora*-like progenitor) of Sarraceniaceae is doubted rather overhastily although no morphological characters unambiguously support the generic relationships assumed here. Further studies will have to aim at the identification of "primitive" plesiomorphous character-states in order to elucidate the evolutionary course of the family. Infrageneric speculations are also presented in this paper but grouping *Heliamphora nutans* as a sister to a clade comprising *H. minor* and *H. tatei*, or the inclusion of *Sarracenia leucophylla* and *S. purpurea* in one group and *S. flava*, *S. minor* and *S. psittacina* in another are so far away from any classification proposed previously that one cannot but wonder if the molecular data studied here are suitable tools at this taxonomic level. (JS)

Takeda, A. & S. Watanabe. 1997, Structure and Regeneration of a Plant Community of a New Variety of *Pinguicula vulgaris* (Lentibulariaceae) in Mie Prefecture, Journal of Japanese Botany, 72, pp. 229-237.

The growth conditions of a supposedly rare taxon considered a new variety of *Pinguicula vulgaris* by the authors are investigated. The results suggested that the communities of this plant are sustainable but the removal of adult stocks by natural or human disturbance will accelerate their degeneration. The new variety differs from *P. vulgaris* proper by its larger more numerous flowers with longer spurs and the very large leaves. These are, however, almost all the features distinguishing *P. macroceras* (which substitutes *P. vulgaris* in the circumboreal-pacific region, including Japan) from *P. vulgaris*. So the new taxon should rather have been described as a variety or subspecies of *P. macroceras*. Within the limits of this latter taxon, it approaches several so-

called lowland populations in Japan, and to a somewhat lesser degree, the northwest-American *P. macroceras* subsp. *nortensis*. Thus, a more thorough taxonomical investigation is clearly indicated and, as far as is heard from Tokyo, forthcoming. (JS)

Tan, H.T.W. 1997, A Guide to the Carnivorous Plants of Singapore, Singapore Science Centre, Singapore, 177 pp. ISBN 981-00-8629-6.

Throughout the chapters entitled "Native Species and Hybrids," "Exotic Species," "Tropical Pitcher Plant Ecology," and "Conservation and the Law," this booklet is furnished with numerous nice pictures and predominantly well researched text. The Republic of Singapore does not house any endemic plant species, so it is no surprise that the Singaporean carnivorous plants are those species that are rather widespread and well known. The species discussed are *Utricularia caerulea* (common), *U. bifida* (common), *U. aurea* (vulnerable), *U. gibba* (vulnerable), *U. uliginosa* (extinct), *U. minutissima* (vulnerable, new record), *U. punctata* (extinct), *Nepenthes ampullaria* (rare, including the rare, abnormal upper pitchers), *N. rafflesiana* (rare), and *N. gracilis* (common). The hybrids *N. ampullaria* × *gracilis*, *N. ampullaria* × *rafflesiana*, and *N. gracilis* × *rafflesiana* augment the list. The genus *Drosera* is apparently absent from Singapore although the widespread *D. burmannii*, *D. indica*, *D. spatulata*, or *D. peltata* would include Singapore within the general limits of their respective geographic and ecological ranges. Perhaps development in this highly populated region has destroyed suitable before botanists could discover any sundews habitats (even the weedy *Utricularia gibba* is vulnerable here!). Forty-six pages are devoted to various aspects of pitcher plant ecology. A rather weak point is the unfounded assertion that the proteolytic activity found in *Nepenthes* pitchers is not due to proteases produced by the plant (although such enzymes have been already characterized to a considerable degree by other authors). This serves in the first line to propagate a new theory that superoxide radicals secreted into the pitchers (by a not yet known mechanism) should be the principal protein digesting agents. Differences between the species tested may exist but suitable experiments to elucidate the enzymic processes involved are clearly required. The literature reference list is not entirely complete (e.g., the publication by Ratsirarson & Silander, 1996, cited on pp. 125, 128, 131, and 137 is missing). (JS)

Webb, C.J. & W.R. Sykes. 1997, The Reinstatement of *Utricularia protrusa* for New Zealand and an Assessment of the Status of the other New Zealand Bladderworts Based on Seed Characters, New Zealand Journal of Botany, 35, pp. 139-143.

In this paper, the authors describe the seeds of the species of *Utricularia* found in New Zealand. For the first time the seeds of *U. protrusa* have been investigated. These were found to differ profoundly (rounded rather than angled and winged, testa cell margins undulate rather than straight or curved) from the seeds of specimens of *U. australis* from Australia. Based on this difference (the only species having similar seeds being the North American *U. geminiscapa*), the specific distinctness between *U. australis* (with which *U. protrusa* has been united by Taylor, Kew Bull. Add. Ser.14:599, 1989) and *U. protrusa* is re-established. *U. protrusa* is thought to be endemic to New Zealand. It is not mentioned in the paper that the European specimens of *U. australis* very rarely set seed at all, nor have these specimens been compared with the east Asian, Australian, and New Zealandic ones. No difference between the seeds of *U. lateriflora* and *U. delicatula* has been found, but the distinction defined by Taylor (l.c.:184) is left unchallenged. The similarity between the seeds of specimens assigned to *U. novae-zelandiae* and *U. monanthos* is used to corroborate the results of a recent ecological and morphological study (M.S.Reut, New Zealand Botanical Society Newsletter 40:10-11) that the two should be treated as a single species to which the older name *U. novae-zelandiae* is to be applied. This may eventually resolve the problem that Taylor (l.c.:119) left "to subsequent investigations in Australia and New Zealand to produce a better solution". (JS)

News & Views

Barry Meyers-Rice (P.O. Box 72741, Davis CA 95617) writes: According to the criteria of criminal law in the USA, carnivorous plants are guilty of Premeditated Murder. Now the botanical world has a case of Involuntary Manslaughter, or more accurately, Insect-slaughter. The noncarnivorous Indonesian orchid *Dendrobium stratiotes* is being privately grown on Oahu, Hawai'i. After pollinating honeybees crawl into the flowers, they discover they are too large to escape. Trapped inside the flowers, the bees slowly die. The introduction of non-native species is one of the leading causes of species extinction, so it is deliciously ironic that two non-native species are fighting between themselves. Now to teach those USA mainland *Nepenthes* to eat starlings!

O. Clyde Bramblett (Orgel's Orchids, 18950 S. W. 136th St., Miami FL 33196) writes: The weather (during the winter of 1997—eds.) has been too warm—it is like summer. The temperatures have been in the 80's every day for weeks. We had some unseasonably cool weather at first, but it warmed up and stayed warm. The *Sarracenia* are starting to put out new growth and flowers. Hey Guys! It's not spring yet! It has been very dry also, no rain for six or seven weeks. I can see some real problems coming up soon.

We had our annual Fairchild Ramble. Everything went off very well and the ICPS exhibit was well received. The workers this year, besides myself, were Bruce Bednar, Manny Herrera, and Trent Meeks (see the photo by Trent). The weather was great and the crowds were like a flowing river. It is unbelievable to always discover that there is someone who has never ever seen a Venus's Fly Trap before.

Photo Caption: From left to right, Trent, Manny, Clyde, and Bruce.

Andrew Marshall (131 SW 185th Street, Normandy Park, WA 98166) sent a list of the crosses he successfully made during the last few years. For the spring of 1994, female listed first: 1) *N. splendiana* × *N. deslogesii,* 2) (*N. thorelii* × *N.* × *wittei*) × *N. kampotiana,* 3) (*N. thorelii* × *N.* × *wittei*) × *N.* × *mixta.* For the spring of 1995, female listed first: 4) *N. spathulata* × *N. sanguinea,* 5) *N. spathulata* × *N. veitchii,* 6) *N. spathulata* × *N. kampotiana,* 7) *N. spathulata* × *N. maxima.* For the winter of 1996, female listed first: 8) *N. thorelii* × *N. tobaica,* 9) *N. thorelii* × *N. maxima,* 10) *N. spathulata* × *N. maxima,* 11) *N. spathulata* × *N. maxima.* The *N. maxima* used in crosses 7, 9, and 10 was obtained from California State University at Fullerton, while the *N. maxima* used in cross 11 was from

Jeff Shafer. The *N. spathulata* was obtained from the University of California at Berkeley. Horticulturists informally refer to the *N. sanguinea* clone as 'red,' the *N. vietchii* clone as 'lowland,' and the *N. tobaica* clone as 'purple.'

Barry Meyers-Rice (P.O. Box 72741, Davis CA 95617) writes: The Redbud Chapter of the California Native Plant Society is trying to raise another $8000 to buy a property in the mountains of California. This 10 acre site contains *Darlingtonia californica, Drosera rotundifolia*, and many other wetland plants. The present owners are donating significant financial help, and The Nature Conservancy has supplied a matching funds grant. More information on this important site (which contains the world's only population of anthocyanin-free *Darlingtonia*) is in this issue (pages 129-132). If you wish to make a donation to this cause, call Carolyn Chainey-Davis at 916-273-1581. Tax-deductable gifts can be made in your name or in the name of the ICPS.

Obituaries

Clarence Baumgartl (William Baumgartl's father), age 80, died on April 16, 1997 of lung cancer. Clarence was the husband of Marie Baumgartl, owner of Marie's Orchids and Exotic Plants. Marie's Orchids will now be relocated to Oakland, California. The new phone number is 510-633-0300. (Submitted by William Baumgartl.)

Mr. Phil Wight died from a heart attack in May 1997. Phil was well known in the San Francisco area as a collector of orchids and carnivorous plants. He is survived by his wife CeCe. His collections were donated to local botanical gardens. (Submitted by William Baumgartl.)

An Anthocyanin-Free Variant of *Darlingtonia californica*: Newly Discovered and Already Imperilled

Barry Meyers-Rice
P.O. Box 72741
Davis, CA 95617 USA

Keywords: field studies: California (USA), *Darlingtonia*, pigmentation.
Received: 1 October 1997

The discovery

The family Sarraceniaceae contains three genera: *Sarracenia*, *Heliamphora*, and *Darlingtonia*. The genus *Sarracenia* has an unsettled taxonomy, but all authorities agree it contains at least eight species. A number of subspecies, varieties, and forms have also been described. *Heliamphora* has a naturally fragmented range and has responded to this by evolving into several taxa. In contrast, even though *Darlingtonia* grows in scattered montane wetlands throughout southwestern Oregon and northern California, the genus has but a single species, and no significant color variants have ever been discovered.

Until now.

In the spring of 1997 I surveyed a *Darlingtonia* seep in the mountains of north-central California. I had first visited the site in the autumn of 1992 after I had learned of it from Hawkeye Rondeau, a naturalist and intrepid seeker of carnivorous plants. This site is particularly interesting because it is at the extreme southeast edge of the range of *Darlingtonia*. The plants grow in a sloped clearing which is densely hidden on all sides by alders. This clearing measures approximately 20 m × 45 m, and is habitat for a number of other wetland herbaceous genera including *Carex*, *Drosera*, *Mimulus*, *Juncus*, *Orobanche*, *Platanthera*, *Solidago*, and *Veratrum*. Prominent wetland woody plants include *Alnus incana* subsp. *tenuifolia*, *Leucothoe davisiae*, *Pinus contorta* subsp. *murrayana*, *Rhamnus alnifolia*, and *Vaccinium uliginosum* subsp. *occidentale*. *Sphagnum* does not occur at this location.

Since it was early in the season the plants were in flower. *Darlingtonia* inflorescences are similar in plan to those of *Sarracenia*. Each erect peduncle bears a single pendulous flower that has five large yellow drooping sepals. The five translucent red petals are so closely pressed to each other that together they form a protective chamber around the anthers and gynoecium (see Schnell, 1976, figures 4.2 & 4.3). This chamber may only be entered near the petal tips, apparently ensuring that visiting insects will deposit pollen upon the stigma immediately upon arrival. As my ramblings took me to a much smaller (11 m × 13 m) adjoining clearing of plants, I was greatly thrilled to find anthocyanin-free *Darlingtonia* specimens. In this article I describe some of my observations of what I will refer to as these "variant plants," as well as how you may obtain seed of this variety. The precarious conservation status of these variant plants is also discussed.

Anthocyanin is a pigment found in many plants and is the source of red and pink coloration in plants in the *Sarracenia* family. Recent work by Sheridan (1997) indicates that a single mutation can block the production of this pigment in *Sarracenia*. A number of *Sarracenia* mutants have been reported which lack anthocyanin (this is reviewed in Sheridan's work). On occasion *Sarracenia* plants have been found which have abnormal flower colors but which are not completely anthocyanin-free plants. At first I thought the variant *Darlingtonia* plants were such floral mutants, but inspections of their growth crowns revealed a complete absence of red pigmentation in the leaf shoot apexes and developing pitchers. (A subsequent literature search revealed that the plants had previously been noted by a field researcher who thought the plants were merely yellow-flowered; Elder, 1994.) The variant nature of these plants is clearly genetic and not environmental because of the following reasons.

1) Most of the variant plants were growing in full sun so the absence of anthocyanin is not a response to inadequate light levels. Three variant plants that did grow in

shade exhibited the same pigmentation characteristics as their sunlit companions.
2) No intermediate color forms were noted. This is parallels the behavior of the anthocyanin mutation in the genus *Sarracenia*.
3) Variant plants grew interspersed with normal plants, so local factors such as chemicals leaching through the soil could be eliminated. Furthermore, the complete suppression of anthocyanin pigments by environmental effects is unknown in Sarraceniaceae.

As the flowering season progressed I carefully surveyed the site using binoculars (I avoided tromping through the seep because it is so delicate). The variant plants occurred in nine separate loose associations, six of which were in the smaller clearing. A total of 105 variant flowers were observed. In comparison, by measuring the flower number density at various locations (typical values were 11—18 flowers m^{-2}) and extrapolating over the area of the two clearings, I estimate that approximately 16,000 normal red flowers were produced this year. Even at this site—its only known occurrence—the variant form represents less than 1% of all the plants present. No doubt a few flowers eluded me, but I probably detected all the major associations of flowering specimens. Surveys of nearby *Darlingtonia* sites revealed no other variant plants. Since *Darlingtonia* plants do not have much red coloration in their pitchers, late-season variant plants do not look much different from normal specimens and any future surveys for variant plants must be conducted during the flowering season.

Obtaining seed for distribution

Immediately after I discovered the variant plants I contacted the owners of the property and obtained permission to pollinate the plants and collect seed. I selected eleven variant flowers long before they matured and bagged them with 1 mm mesh fabric. The stigmatic surfaces of unbagged plants were usually slightly darker-colored a few weeks after their flowers matured. This discoloration appeared on the bagged plants only after I manually pollinated them. From this I conclude that I successfully excluded pollinators and also that pollinators are present even at this site at the extreme edge of the plant's range. It is still unclear what pollinates *Darlingtonia*, but my measures almost certainly frustrated the efforts of any pollinating agents. Incidentally, nearly every unbagged *Darlingtonia* flower in the clearings contained at least one spider (as has been previously reported, *i.e.* Elder, 1994)—it must be challenging to be a *Darlingtonia* pollinator!

I desired seed of pure anthocyanin-free strains for distribution among scientists and horticulturists so I self-pollinated eight of the bagged flowers. To ensure successful pollen transfer each flower was selfed both 28 May and 1 June. Unfortunately only four of these eight bagged flowers survived to produce seed—shortly after pollination the other flowers died from trauma associated with being handled. Years of experience in *Sarracenia* propagation have shown me that the progeny of such selfings are often not as vigorous as that from cross-pollinated plants. So I pollinated three bagged plants using pollen from two other anthocyanin-free plants (that is, pollen from both pollen donors were applied to each of the three bagged plants). *Darlingtonia* can reproduce vegetatively, both by rhizome division and by stolons. To minimize the chance that the pollen donors were clonally related to the bagged plants, the pollen donors selected were 8 and 11 m from the pollinated plants. Due to handling, only one of these flowers survived to produce seed—*Darlingtonia* peduncles are very brittle, especially when the scientist pollinating them is beset by voracious mosquitoes and gathering lightning storms.

Seed was harvested in September and is available through the ICPS seedbank (see the seedbank listing in this issue). This seed is not regulated by C.I.T.E.S., so it may be bought by any member of the ICPS. To simplify the seed distribution and to increase the chances that the most vigorous seeds are widely distributed, the seed from the pollination trials were mixed together. As a result three different mixes of seed are available.

Mix #1: The results of five manually pollinated variant flowers were combined. Four of the flowers were self pollinated, one was crossed with other variant flowers. These are very likely to be anthocyanin-free plants.

Mix #2: Five unbagged variant flowers were allowed to be pollinated by whatever natural mechanisms are at work in the seeps. If they are selfed then the progeny will be anthocyanin-free. If they were crossed they are very likely to be hybrids with normal

flowers. In this case they will probably appear to be normal red-flowered plants.

Mix #3: Seed from nine wild pollinated flowers were collected at the end of the season. The plants are from a unique and wonderful location but will probably produce normal red flowers. Experimenters may wish to use these seeds as controls in studies of the plants from this site.

Seed quantities from this season are limited, but samples from all three mixes are being sent courtesy of the ICPS to other seedbanks around the world. As I write this, cooperative agreements have been arranged with the following organizations (more are being developed): Australian Carnivorous Plant Society (P.O. Box 391, St. Agnes, South Australia 5097), and Gesellschaft für fleischfressende Pflanzen (Frank Gallep, Zweibrückenstr. 31, D-40625 Düsseldorf, Germany). This list of societies is not meant to endorse or snub anyone—it merely represents an eclectic list of societies with which I am familiar. Investigate the seedbanks of your local organizations for possible additional listings.

If you obtain seed, bear in mind you are part of a scientific experiment. I do not know if the plants will breed true. It would be valuable for any growers to report their results to Carnivorous Plant Newsletter.

Conservation concerns and considerations

Field collecting being condoned by the International Carnivorous Plant Society? This is scandalous!

No, not in this case. First, all access to the site was fully allowed by the owners. Second, only seeds were collected, with the exception of a single plant which was used for an herbarium specimen. Third, this situation represents the first find of this plant and is a valid attempt at introducing the plant into cultivation. Fourth, of the 105 variant flowers at the site, only sixteen were manipulated, so the effects from interfering with just one season's flowers are probably insignificant (recall that *Darlingtonia* is a perennial species).

The welfare of the plants is certainly being considered. Indeed, everyone who knows the site has agreed to remain quiet about its location. These measures are justified because plants and fruit of anthocyanin-free *Sarracenia rubra* subsp. *jonesii* have been repeatedly poached from that plant's only known location, in spite of its being a preserve protected and studied by The Nature Conservancy.

The immediate future for this site is precarious. Although it was stewarded well by its owners for many years, when I contacted them they told me they had sold it and the new owners intended to log the property. While the timber value of the seep is minimal, the timber value of the surrounding forest is high. I met with the new owners and their forester. Through nonconfrontational discussions, I was able to educate the owners as to the biological value of the seep. An interesting development occurred several weeks later when the California Department of Forestry (CDF) was reviewing the timber harvest plan for the site. News of this logging operation reached the internet; the resulting deluge of faxes and mail to the CDF was a huge surprise. The CDF consulted with a number of experts (including representatives from the ICPS) and ultimately the property owners volunteered not to log within 100 feet of the seep, so the chances of disturbing the water flow or accidentally felling a tree into the seep were diminished.

At the time of this writing, the site is once again for sale. The Redbud Chapter of the California Native Plant Society (CNPS) is attempting to cobble together enough money to purchase the site. Bound by National Forest on three sides, including the uphill side, this site is excellently situated to be a well-protected preserve. The present owners have agreed to make significant donations to expedite the process, and The Nature Conservancy has contributed a large matching funds grant. Only $8000 remains to be raised in order to make this 10 acre preserve a reality. That might not seem like much, but for these plants it is the difference between protection and another episode of logging. If you wish to donate to this important project, call Carolyn Chainey-Davis (CNPS, 916-273-1581) by April 1998.

While the International Carnivorous Plant Society played a significant role in protecting this site through educating the land owners and advising the CDF, it must take a back seat to the phase of purchasing the site for protection. When we become a non-profit organization it might be possible for us to be more active in this kind of project.

Figure 1: Anthocyanin-free and normal *Darlingtonia* flowers.

Directions for future study

If this site survives the next few years of logging and transitions, it will be an interesting laboratory for the genetic study of anthocyanin-free plants. If Sheridan's work is correct and the production of anthocyanin in *Sarracenia* may be modulated by a single mutation, it is plausible that the trait in *Darlingtonia* is similarly recessive. Indeed, no intermediate flowers were observed (i.e. flowers with pink or only partly red flowers) so this seems likely. It would be interesting to investigate the progeny of green × red crosses (using Sheridan's red/green nomenclature). The results from red × red or red selfings would also be interesting. It might be that many apparently normal red plants are heterozygous and such pollination's work would result in 25% green seedlings and 75% red seedlings.

By climbing 18 m up into a nearby conifer and photographing the seeps, I produced crude overhead maps. These suggest the anthocyanin-free plants occur preferentially (but not exclusively) at the edges of the seep. The reality of these measurements must be investigated using careful statistical models.

Finally, as information regarding this interesting form accumulates it may be appropriate to botanically describe the variant at the *forma* level. If so, it will most certainly not be "*Darlingtonia californica* f. *heterophylla*," so I do not want to see that invalid name thrown around by growers!

Acknowledgements:
Special thanks are due to the various owners of this special habitat and their foresters for their foresight and generosity, to The Nature Conservancy (California Regional Office) for useful information regarding the history of the seep, to Carolyn Chainey-Davis of the California Native Plant Society for her untiring efforts, and to Mandy Tu for her botanical expertise and boundless enthusiasm.

References:

Elder, C. L. 1994, Reproductive Biology of the California Pitcher Plant (*Darlingtonia californica*), Fremontia, 22:4, p29—30.

Schnell, D. E. 1976, Carnivorous Plant of the United States and Canada, John F. Blair (publisher), Winston-Salem, North Carolina.

Sheridan, P. 1997, Genetics of *Sarracenia* Leaf and Flower Color, Carniv. Pl. Newslett., 26: 51—64.

The 1997 Conference of the International Carnivorous Plant Society

This year the Atlanta Botanical Garden was kind enough to host the spectacularly successful Conference of the ICPS. Approximately 130 members attended the three day event (May 16—18) to listen to talks, watch videos, exchange plants, and learn from each other's experiences. Trips to carnivorous plant habitats filled two more days.

We wanted to produce a pamphlet-sized publication describing the meeting, but fiscal realities intervened. (One of the anticipated benefits of the ICPS becoming a non-profit organization is that we should be able to afford a separate publication for the 1998 conference.) To let you know what you missed, or remind you of what you saw, we are reprinting a schedule of the event. We hope this encourages you to attend the 1998 conference in Germany.

Day One

- Welcoming Comments, Ron Determann (Atlanta Botanical Garden) & Rick Walker (ICPS).
- The Carnivorous Plant Conservation Program at the Atlanta Botanical Garden, Ron Determann (Atlanta Botanical Garden).
- Conservation Projects Involving the Three Federally Endangered *Sarracenia* Species: *S. oreophila, S. rubra* subsp. *alabamensis,* and *S. rubra* subsp. *jonesii*, Nora Murdock & Cary Norquist (United States Fish and Wildlife Service).
- The Importance of Special Collections at Public Institutions, Leo Song (ICPS).
- West Coast Bogs, Joe Mazrimas (ICPS).
- Greenhouse Cultivation of *Nepenthes*, Cliff Dodd, II.
- Invasion of the Carnivores, Peter D'Amato (California Carnivores).
- Poster session, plant sale, tour of Atlanta Botanical Garden.

Day Two

- Habitat Management and *in situ* and *ex situ* Conservation of Endangered Carnivorous Plants in Japan, Katsuhiko Kondo (Hiroshima University).
- Carnivorous Plant Tissue Culture: Past, Present and Future, Ron Gagliardo (Atlanta Botanical Gardens).
- Conservation for the Collector, Thomas Gibson (University of Wisconsin-Madison).
- The Breeding and Feeding of *Sarracenia,* Larry Mellichamp, (University of North Carolina, Charlotte).
- Ecology and Management of Pitcher Plant Savannas in the Coastal Plain of the South East USA, Sharon Hermann (Tall Timbers Research Station).
- Commercial Production of Carnivorous Plants by Tissue Culture, Mike Rink (Agristarts).
- Conservation and Research of Carnivorous Plants on a Local and International Level, Madeleine Groves (Royal Botanical Garden, Kew).
- Tour of Atlanta Botanical Garden.

Day Three

- Diversity Within the Genus *Utricularia*, Martin Cheek (Royal Botanical Garden, Kew).
- Altitudinal Distribution of *Nepenthes* on Mt. Kinabalu, Rimi Repin (Sabah Parks).
- Defying the Deathtrap: Mites and Flies of Pitcher Plants and Their Implications for Conservation, Rob Naczi (Northern Kentucky University).
- Aspects of Evolutionary Biology, Genetics, and Biochemistry in *Sarracenia*, Phil Sheridan (Virginia Commonwealth University, Meadowview Biological Research Station).
- The International Carnivorous Plant Society, Rick Walker (ICPS).
- Carnivorous Plants in the Classroom, Michael Szesze.
- Deathtraps and Lifelines (Video), Thomas Carow.

Day Four — Day Five

- Field trips through Florida (including Apalachicola National Forest), roadside habitats in Alabama (including a private holding noted for carnivorous plants).

Index of Contributors

A Contest!

The International Carnivorous Plant Society is holding a contest to develop a logo! The rules are simple: 1)Only members can submit designs, either made by themselves or an artistic associate 2)A member can submit as many as five completed designs 3)The artwork must be completely original 4)The design must be black and white, should feature the letters "ICPS", and must retain its value even when reduced to a few centimeters in size 5)Contest Judges may not submit entries. A panel of the ICPS officers and editors (past and present) will judge the entries. The three runner-up submissions will be printed in the June 1998 issue of Carnivorous Plant Newsletter. The winner will be awarded two free years of Carnivorous Plant Newsletter.

Artwork should be submitted in excellent condition for computer digitization and reduction. The design should fill approximately a 10 cm × 10 cm (4 inch × 4 inch) area. Computer files of a common format (TIF, GIF, JPEG) may also be submitted on a PC diskette. All submissions must be *received* by Rick Walker by 20 April, 1998 (see the inside cover for his address). Please include your phone number so we may reach you rapidly. Be judicious with your designs—details and delicate shadings are likely to be lost in the scanning and reduction stages. While funny, joke logos depicting bloodthirsty plants will probably not win the top prize.

INDEX